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1987
PLAN OF WORK
for Cooperative Hydrology Investigations

ureau of Land Management & U.S. Geological Survey -- Water Resources Division

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Preface

The Bureau of Land Management each year requires data collection and analysis and technical consulting services of its sister agency, the U.S. Geological Survey (GS). For fiscal year 1987 services are requested of the GS's Water Resources Division.

The Plan of Work includes both Federal Coal Management Program (abbreviated CMP in summaries) and non-CMP work items. Non-CMP work items are identified by a separate BLM appropriation code included in each work item description. Agency technical contacts for the 1987 BLM/GS contract are as follows:

Bureau of Land Management

Service Center
    Eric B. Janes, Contracting Officer's Representative, and Hydrologist
    (FTS 776-0147).

U.S. Geological Survey

Water Resources Division
    Donald A. Goolsby, Regional Energy Coordinator, Central Region
    (FTS 776-5937)

    Donald L. Coffin, Regional Program Officer, Central Region
    (FTS 776-5929)

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SUMMARY OF BLM FUNDS FOR HYDROLOGIC INVESTIGATIONS
USGS WATER RESOURCES DIVISION
1987

STATE	CMP	4351	4352	4341	O & C 6333	TOTAL
Colorado	$ 20,000			$87,180		$107,180
Idaho				23,520		23,520
Montana	68,000	$ 3,000	$2,000	45,000		118,000
Oregon					$22,350	22,350
Utah	170,000			19,130		189,130
Wyoming	162,000					162,000
TOTALS	$420,000	$ 3,000	$2,000	$174,830	$22,350	$622,180

PLAN OF WORK
for
HYDROLOGIC INVESTIGATIONS
BUREAU OF LAND MANAGEMENT AND
USGS WATER RESOURCES DIVISION
Fiscal Year 1987

AUTHORITY

The General Agreement between the Bureau of Land Management (BLM) and the Geological Survey (GS), dated June 14, 1985, is considered the basis for this Plan of Work.

PURPOSE

The purpose of this Plan of Work is to specify the nature and amount of assistance to be provided by the GS to BLM during FY 87.

SCOPE

This Plan of Work includes hydrologic services to be provided by the GS to BLM in Fiscal Year 1987 in the States of Colorado, Idaho, Montana, Nevada, Oregon, Utah, and Wyoming.

The GS will provide the services, including personnel, equipment, supplies, and facilities, to conduct water resources investigations in areas designated by the BLM. Services will include installation, operation, and maintenance of surface-water gages, ground-water wells, and climate stations, water-quality data collection and analysis.

PROCEDURE

Fiscal Year 1987 is the thirteenth year of this cooperative effort. Some work that began in earlier Fiscal Years will be continued in Fiscal Year 1987, while some projects may be dropped. A few studies will begin in Fiscal Year 1987, some of which will carry into Fiscal Year 1988. Proposals will be dis- cussed in joint meetings among the GS WRD District Offices and BLM State offices and the Denver Service Center. The Plan of Work is developed by the Denver Service Center after negotiations between BLM field offices to deter- mine needs and GS field offices to determine capabilities, recommended hydrologic procedures, and for coordination with other studies conducted by the GS in other programs. The development of budgets takes into account the program needs of both agencies and funds available to meet those needs. When mutual interests are strong, funds from both agencies are applied. Funds tabulated in the work order, however, represent only those from BLM.

Field investigative procedures will be standard GS water resources investigation techniques.

REPORTS

Reporting will generally be standard GS report procedures with some deviations that are detailed in the Plan of Work.

Annual project progress reports will be prepared by each Water Resources Division district and routed through the Central Region to the Contracting Officer's Representative (BLM). Due date for these reports will be September 30, 1987. The GS will provide the appropriate BLM State Office with a copy of each progress report.

Prior to publishing any work involving BLM funds, the GS will forward copies of the draft final project report to the appropriate BLM State Office contact for review and approval. GS will forward two copies of the published reports to the Contracting Officer's Representative (BLM) and as many copies to the appropriate BLM State Office as agreed upon mutually between GS and BLM.

FUNDING

BLM will provide funds to GS to cover all authorized work listed in this Plan of Work, not to exceed $622,180 in FY 87. Billing will be through SIBAC TFS 7306, which will be current as of the beginning of the quarter during which the interagency agreement is signed. Subsequent bills will be issued at 3-month intervals except during the last quarter when bills will be submitted at 1- to 2-month intervals. A table showing funding sources for BLM/USGS cooperative hydrology investigations will be provided by BLM as a part of the interagency agreement and/or modifications thereto. The GS will consider this account a reimburseable account with one-year funds.

COLORADO

SUMMARY OF FUNDS - FY 87
WATER RESOURCES DIVISION

Project Name	CMP	4341
Hydrologic Characterization of Hart Syncline Area, NW Colorado	$20,000	
Hydrology of Coal Spoils, NW Colorado		
Assessment of Aquifers in Western Colorado		$25,000
Operation of BLM Stations - San Luis		23,180
Precipitation ANalyses, Gothic Colorado		5,000
Sand Wash Sediment		18,000
TOTAL:	$20,000	$71,180

Total for State of Colorado: $ 91,180

COLORADO

Neil Morck, BLM, State Director (FTS 776-1721)
Rhio Jackson, BLM, Hydrologic Investigations Coordinator (FTS 776-1752)
Steve Vandas, BLM, Hydrologic Investigations Coordinator (FTS 776-1762)
C.A. (Terry) Pascale, WRD, District Chief (FTS 776-1762)

I. Hydrologic Characterization of the Hart Syncline Area, NW Colorado

William Van Liew, WRD Project Chief, FTS 776-9404

A. Location:

The study area is located southeast of Craig, Colorado. Formations of interest include the water-yielding units of the Mesaverde Group and the unconsolidated alluvial deposits along the stream channels.

B. Objectives:

To describe baseline hydrogeologic conditions in the Hart Syncline area. Specifically:

1. To determine aquifer(s) location, hydraulic properties, and water chemistry,
2. to determine surface-water discharge, chemistry, and sediment load, and
3. to determine the degree of interaction between the ground water and surface water.

C. Approach:

Fiscal Year 87 is the final year of the study. Data are being compiled and the interpretive report will be given to cooperating agencies for review in the spring of 1987.

D. Report:

A Water-Resources Investigation Report describing the results of the study will be prepared in FY 1987.

E. Costs:

Total project cost for FY 87 is $60,000. Funding is provided by USGS $20,000, Moffatt County $20,000, and BLM $20,000. The BLM cost breakdown is as follows:

Salaries	$18,000
Travel and Vehicles	1,200
Laboratory	800
TOTAL	$20,000

II. Hydrology of Coal Spoils in NW Colorado

Robert S. Williams, Jr., WRD Project Chief, FTS: 776-9404

A. Location:

The study area is located in northwestern Colorado between Steamboat Springs and Craig and extends from an east-west line from the Yampa River at the north to approximately 20 miles south of the Yampa River.

B. Objectives:

This project will describe the processes controlling the hydrology of reclaimed coal spoils.

1. Determine the sources of recharge to and discharge from reclaimed coal spoils.
2. Determine the rate of water movement through reclaimed coal spoils.
3. Determine the geochemistry of a reclaimed coal spoil and the magnitude of change in concentrations of dissolved constituents in coal-spoil discharge.

C. Approach:

The general approach will be to select two or three reclaimed coal-spoil sites for study. Available surface-water, ground-water, and water-quality information will be used in conceptualizing the hydrology of potential sites. Unreclaimed and recalimed old spoil piles exist in the vicinity of current mining activities. The water chemistry of unreclaimed and old reclaimed spoil piles will be analyzed to evaluate long-term water-quality trends. The information obtained from the old spoil piles could be very valuable for determining if estimates of duration of mining impact are accurate.

One of the first efforts in the study will be to compile and evaluate available data for coal-spoil sites. This data will be used for a preliminary evaluation of the hydrology and geology of proposed reclaimed coal-spoil sites. Precipitation gages, stream gages, wells, and soil water access tubes that have been installed from previous investigations will be assessed to determine if they can be used for the study. Sites that have sufficient data and available onsite instrumentation that meet the study needs will be designated as priority sites for the proposed study.

D. Reports:

Progress Reports

An annual oral presentation describing progress and significant results will be given by the USGS-WRD, with assistance and input from other advisory team members. The purpose of these presentations will be to provide preliminary information to interested groups as soon as possible.

Final Interpretative Report

The USGS-WRD will prepare a Water-Resources Investigation Report or a Water Supply Paper upon completion of the study.

Regulatory-Management Reports

Some adivsory team representatives intend to produce separate management-related reports based upon the results from the USGS-WRD final interpretive report. These reports will discuss the regulatory program implications of the investigative conclusions of the study.

E. Funding:

Project costs will be shared by BLM and OSM. During FY 87 BLM's share will be $0.

III. Assessment of Aquifers in Western Colorado

Glenn Hearne, WRD Project Chief, FTS: 776-4886

A. Location:

Aquifers under BLM lands in western Colorado.

B. Objective:

1. To estimate whether withdrawals from the major aquifers beneath land administered by BLM in Colorado will result in streamflow capture greater than or less than 0.1 percent of the rate of withdrawals after 100 years.
2. Quantify the volume of water under lands administered by BLM that is estimated to result in streamflow capture of less than 0.1 percent of the rate of withdrawals after 100 years.

C. Approach:

This project will be conducted using existing data from the ongoing Regional Aquifer System Analysis of the Upper Colorado River Basin in conjunction with analytical and simulation techniques:

1. Potential aquifers will be selected based on potentimetric maps and water-level data for which data are available in western Colorado.
2. Analytical screening techniques will be used to determine streamflow capture and to determine the potential effect of withdrawals.
3. For selected regions, simulation models will be used to project the rate of streamflow capture resulting from the pumping of hypothetical wells for 100 years.
4. Estimates of the volume of ground water available as "non-tributary" associated with BLM lands will be made.

D. Reports:

Analytical work will be essentially completed in FY 87, and a report will be prepared in FY 88.

E. Funding:

	FY 87
Salaries	$23,000
Computer	2,000
TOTAL	$25,000

IV. Operation of BLM Stations in San Luis Valley

Russell K. Livingston, WRD Project Chief, FTS: 323-9345

A. Location:

Five study sites in San Luis Valley: one reservoir site--change in contents; and four reservoir sites--inflow. Recording rain gages are operated at five sites. Twenty supplemental nonrecording raingages are also operated to provide spatial definition of precipitation.

B. Objective:

To determine effects of changes in land use on the runoff from the small drainage areas. Daily flow and rainfall will be tabulated for the four reservoir sites.

C. Report Products:

Data are published annually in "Water Resources Data for Colorado."

D. Distribution of Funds:

Salaries	$19,500
Computer	3,680
TOTAL	$23,180

V. Precipitation Samples Analyses from Gothic, CO

Robert F. Middelburg, WRD, Project Coordinator, FTS: 776-4890

A. Location:

Precipitation collector is located at Gothic, Colorado, Gunnison County.

B. Objective:

1. Analyse samples collected for low level concentrations of dissolved major ions and nutrients. Constituents are:
    - Calcium
    - Magnesium
    - Potassium
    - Sodium
    - Bromide
    - Chloride
    - Floride
    - Nitrate + Nitrite
    - Ammonia Nitrogen
    - Phosphorus
    - Ortho Phosphorus
    - pH
    - Specific Conductance
    - Sulfate
2. Review results for validity and quality control.
3. Provide analytical results to the agency and store analytical results in District WATSTORE water-quality data base.
4. Provide training for sample collection and processing.
5. Provide sample supplies appropriate for collection, preservation, and shipment to USGS laboratory.

C. Approach:

1. Samples collected by BLM personnel and shipped to USGS Central Laboratory for analyses.
2. Review analytical results for quality and completeness, request re-analyses when appropriate.
3. Send copies of approved results to agency and store data in local water-quality data base.
4. Supply sampling supplies and training as requested.

D. Report:

Data will be published in the Colorado District annual data report.

E. Costs:

Laboratory analyses	$5,000

VI. Sand Wash Sediment:

Robert L. Tobin, Meeker Office, FTS: 8 (303) 878-5086

A. Location:

Sand Wash basin is in northwestern Colorado, approximately 50 miles west-northwest of Craig.

B. Objective:

Establish hydrologic data collection equipment and collect flow, sediment, and water-quality data to define the hydrologic characteristics of Sand Wash basin. Little or no data presently exists.

C. Approach:

Establish a continuous-flow gaging station and periodically collect samples of suspended and bedload sediment, and water quality to define variations with stage. Yearly data collection would include:

1. Suspended sediment . . . 10-15 samples.
2. Suspended-sediment size analyses . . . 6 samples.
3. Bedload . . . 2-4 samples.
4. Water chemistry . . . 4 samples.

D. Reports:

All data will be published in the USGS annual water-data reports.

E. Costs:

Salaries	$ 9,100
Vehicles and travel	1,200
Laboratory	2,500
Equipment	5,200
TOTAL	$18,000

VII. Hydrologic Investigation of Badger Creek

Russell K. Livingston, WRD Project Chief, FTS: 323-9345

A. Location:

Badger Creek, tributary to Arkansas River

B. Objective:

Determine surface-water quantity and sediment yield characteristics of Badger Creek watershed at two data-collection sites. Crest stage gages will also be operated at four sites in the Badger Creek watershed to determine source areas of flood discharge.

C. Report Products:

Data are published annually in "Water Resources Data for Colorado."

D. Distribution of Funds (CO-930-4341-06-2512:

Salaries	$ 9,725
Travel and Vehicles	2,575
Laboratory	3,700
TOTAL	$ 16,000

IDAHO

SUMMARY OF FUNDS (FY 86)
WATER RESOURCES DIVISION

Project	4341
O & M Gaging Stations	
Lolo Creek	5,680
Sawmill Creek	4,540
TOTAL	$10,220
Hagerman Perched Aquifer Study	$13,300
	$23,520

Total for the State of Idaho: $23,520

IDAHO

Delmar D. Vail, BLM State Director (FTS 554-1401)
Steve Ellis, BLM Hydrologic Investigations Coordinator (FTS 554-1892)
Jerry L. Hughes, WRD District Chief (FTS 554-1750)

I. Operation and Maintenance of Two Gaging Stations

Robert W. Harper, WRD Project Chief (FTS 554-1750)

A. Location:

1. Lolo Creek, near Greer, ID
3. Sawmill Creek, near Clyde, ID

B. Data Collection: October 1, 1986 through September 30, 1987.

C. Reports: To be published in the USGS "Water Resources Data for Idaho."

D. Funding:

One station @ $5,680 (ID-060-4341-14-25-12)	5,680
One station @ $4,540 (ID-030-4341-14-25-12)	4,540
TOTAL	$10,220

II. Hagerman landmark perched aquifer study, Hagerman, Idaho

Harold W. Young, WRD Project Chief, (FTS 554-1750)

A. Location: Hagerman, Idaho

B. Objectives:

1. To investigate the perched aquifer and study the influence of canal loss on the aquifer.
2. To monitor ground water levels in the perched aquifer to determine the influence of recharge from irrigation canals.

C. Procedure: Data will be collected from 5 continuous 30-day chart recorders and 6 monthly readings from observation wells.

D. Reports: Certified data will be furnished to the BLM as it is produced and approved. Data will also be published in USGS annual data reports.

E. Timeframe: USGS involvement will be completed in FY 1987. The BLM will continue to monitor the wells in the future until the problems have been corrected.

F. Distribution of Funds: (ID-010-4341-14-2513)

Continuous recorders, 2 sites (Apr.1-Sept. 30) and manpower costs for data analysis	3,900
Operation and maintenance of 5 recorders	6,250
Monthly measurements at 6 additional sites @ $850 each ($3,400)/yr October 1, 1986-April 1, 1987	3,150
TOTAL	$13,300

MONTANA

SUMMARY OF FUNDS
WATER RESOURCES DIVISION

Project	CMP	4341	4351
I. Hydrologic Characterization			
A. Streamflow and Quality		$28,700	
B. Ground-Water Monitoring		2,300	
II. Cumulative Effects in Hanging Woman Creek Basin	$68,000		
III. Flow Characteristics of Milk River Tributaries		14,000	
IV. Channel Geometry Measurements			$ 5,000
TOTAL	$68,000	$45,000	$ 5,000

Total for State of Montana: $118,000

MONTANA

Dean Stepanek, BLM Montana State Director (FTS 585-6462)
Peter Bierbach, BLM Hydrologic Investigations Coordinator (FTS 585-6655)
Joe A. Moreland, WRD, District Chief (FTS 585-5302)

I. Hydrologic Characterization of Eastern Montana Coal Areas (BLM-RDTS-7210.102/3340.502)

A. Network Maintenance of Streamflow

Ronald R. Shields, WRD Project Chief (FTS 585-5496)

1. Objectives: Collect streamflow data at key locations to supplement other programs. The data is essential in defining runoff and water quality from potential impact areas, determining streamflow characteristics, and providing a data base from which future changes can be analyzed.

2. Procedure: Standard U.S. Geological Survey methods of surface-water and water-quality data collection will be used to obtain data at the following stations:

Tongue River below Tongue River Dam-Q
Rosebud Creek at mouth near Rosebud-S
Hanging Woman Creek near Birney-S,Q
Redwater River at Circle-S

S = Streamflow   Q = Water quality

3. Report Products: Basic records from streamflow sites will be submitted to BLM annually or as mutually agreed upon. Records will be published by the USGS in an annual report, "Water Resources Data for Montana." The data will be used by the USGS in preparing interpretive reports described in other parts of the work plan.

4. Relationship to Other USGS Studies: This program will supplement and be correlated with other USGS programs of streamflow data collection. Numerous other stations are operated in this area.

5. Distribution of Funds:

Salaries	$ 17,000
Lab	3,500
Travel	5,200
Supplies	1,000
Data Processing	2,000
TOTAL	$28,700

B. Ground-Water Monitoring

Robert Davis, WRD Project Chief (FTS 585-5263)

1. Location: Fort Union and Powder River Basin coal regions of eastern Montana.

2. Objectives: To provide ground-water data base from which an assessment can be made of the resource, future responses to stresses can be predicted, and pollution and supply problems can be detected and defined. This activity provides for long-term collection of ground-water data from selected observation wells. Specifically, wells monitored in CMP study sites are incorporated in this program to extend periods of data collection.

3. Procedures

   a. Make water-level measurements and continue operation of water-level recorders.
   b. Compile and analyze data.

4. Report Products: Data collected under this program will be incorporated in CMP Site Study reports and in regional evaluations. The data will be stored in automated data files for rapid retrieval.

5. Relationship to Other USGS Studies: Data collected under this activity will be used to help define premining conditions of potential lease sites, help calibrate ground water models to predict the effects of mining, and help transfer data to surrounding areas from intensively studied sites.

6. Distribution of Funds:

Salaries for Data Collection	$1,000
Travel	600
Data Processing	700
TOTAL	$2,300

II. Cumulative Effects of Coal Mining on Water Quality in Hanging Woman Creek Basin, Southeastern Montana (BLM-RDTS-7210.142)

Michael R. Cannon, WRD Project Chief (FTS 585-5263)

A. Location: The study area is in the Powder River coal region and includes part of Rosebud County.

B. Objective: The objective is to develop a dissolved-solids load budget and evaluate the potential effects of surface coal mining on dissolved solids in the stream and alluvial aquifer, both of which are used for irrigation of agricultural crops.

C. Procedures:

1. Existing surface-water flow and quality data will be supplemented by related studies.
2. Existing wells in the basin will be inventoried and sampled.
3. Observation wells will be installed where necessary. Cuttings will be obtained from the drilling.
4. Data evaluation:

    a. Develop and solve a mass-balance equation that defines all inflows and outflows of dissolved solids for the basin.

    b. Predict the quality and quantity of spoils water that would be generated by the post-mining landscape. Batch-mixing experiments will be performed using cuttings. Results will also be compared to paste-extract data from related study.

    c. Combining the additional load from the mined area to the budget equation for the undisturbed stream-aquifer system and determine the effects on dissolved-solids concentrations.

D. Report Products: The data and results will be published in the USGS Water-Resources Investigations series by September 30, 1988.

E. Relationship to Other Studies: Paste-extract data is anticipated to be obtained by a proposed concurrent study by the Montana Bureau of Mines and Geology.

F. Distribution of Funds:

	FY 87
Salaries	$50,000
Travel	6,000
Water and Rock Analyses	9,000
Computer and Miscellaneous	1,000
Report Processing	2,000
TOTAL	$68,000

III. Flow Characteristics of Small Tributaries of the Milk River

Charles Parrett, WRD Project Chief (FTS 585-5263)

A. Location: Northeastern Montana

B. Objective: The objective is to define low- and mean-flow characteristics for selected small tributary streams in the Milk River Basin. Accomplishment of the objective potentially will enable other investigators to evaluate the effects of small stockwater dams on the runoff characteristics of the Milk River and tributaries.

C. Procedures:

1. Collect streamflow data at four sites on small intermittent drainages in the Rock Creek basin and on the Rock Creek near Thoeny, Montana site until 5 complete years of records are available.
2. Analyze the data at the end of the data-collection period and prepare a report summarizing the streamflow characteristics of small drainages in the Rock Creek portion of the Milk River basin.

D. Report Products: Streamflow data will be published in the USGS annual data report. The results of the data analysis will be published in the USGS Water-Resources Investigations series by September 30, 1988.

E. Relationship to Other Studies: Concurrent study investigating low- and mean-flow characteristics of small Milk River tributary streams draining from the south is being funded by BIA.

F. Distribution of Funds:

Salaries	$10,000
Travel	2,000
Data Processing	1,500
Report Processing	500
TOTAL	$14,000

IV. Channel Geometry Measurements

Charles Parrett, WRD Project Chief (FTS 585-5263)

A. Location: Southwestern Montana

B. Objective: The objective is to estimate mean and peak discharge characteristics for selected ungaged streams in the upper Missouri River Basin. Accomplishment of the objective will assist BLM investigators in establishing equitable reserved water-rights claims under Montana law.

C. Procedures:

1. Channel geometry will be measured at approximately 30 selected sites in the upper Missouri basin.
2. Regression equations relating discharge to channel geometry that were developed in previous studies will be used to estimate mean and peak discharge at each site. Results will be reported in a letter to BLM by September 30, 1987.

D. Report Products: No formal reports will be prepared.

E. Relationship to Other Studies: Equations in two previous studies will be used to make the required discharge estimates.

F. Distribution of Funds:

Salaries	$ 2,800
Travel	1,900
Data Processing	300
TOTAL	$ 5,000

OREGON

SUMMARY OF FUNDS
WATER RESOURCES DIVISION

Project	6333
I. Operation and Maintenance of Stream Gages	$16,350
II. Sediment Sample Analysis	6,000
Total	$22,350

Total for State of Oregon: $22,350

OREGON

Charles W. Luscher, BLM State Director (FTS 429-6251)
Bill Brookes, BLM Hydrologic Investigations Coordinator (FTS 429-2253)
M.D. Fretwell, WRD State Office Chief (FTS 429-2009)

I. Operation and Maintenance of Three Stream Gages

A. Location: Tucca Creek near Blaine, Ore. (14303200);

East Fork Lobster Creek near Alsea, OR (14306340)

Star Gulch near Ruch, OR (14362250)

B. Product Output:

1. Data from these gages will be entered into WATSTORE and published in the annual report "Water Resources Data for Oregon."
2. BLM Districts will be provided primaries and a year-end station analysis for these gages.

C. Distribution of Funds:

O & M of Three gages @ $5,450	$16,350
TOTAL	$16,350

II. Sediment Sample Analysis

A. Location: Collect approximately 1,000 samples at various field sites, Salem District

B. Product Output:

Data will be entered into WATSTORE. Lab sheets (analytical results) will be provided to the Salem District, BLM.

C. Distribution of Funds (6333):

Salaries	$6,000
TOTAL	$6,000

UTAH

SUMMARY OF FUNDS
WATER RESOURCES DIVISION
Unita-Southwestern Utah Coal Region

	Project	4341	CMP
I.	Cooperative State Programs (UT-1, 3, and 4)	$19,130	
II.	Hydrologic Evaluation of the Castle Valley Ridge and Alkali Creek Coal-lease Areas, Utah		$ 25,000
III.	Hydrologic Evaluation of the Quitchupah, Pines, and L.C. Holding Coal-Lease Areas, Utah		145,000
	TOTALS	$19,130	170,000

Total for State of Utah: $189,130

UTAH

Roland Robison, BLM State Director (FTS 588-5311)
Boyd Christensen, BLM Hydrologic Investigations Coordinator (FTS 588-3120)
Harvey Lee Case III, WRD District Chief (FTS 588-5663)

I. Cooperative State Programs (UT-1, 3, and 4)

Larry R. Herbert, Acting Project Chief (FTS 588-4192)

A. Objective: To determine the sediment, salinity, and discharge of selected streams in San Juan and Garfield Counties.

B. Approach: Operate and maintain sediment, water quality, and gaging stations during FY 87.

C. Report Products: Information will be included in annual basic data report. BLM may request data directly if needed.

D. Distribution of Funds

UT-1 Collection of streamflow records.

Indian Creek	4,940
Bull Creek	4,940
Montezuma Creek (Cost shared with SCS)	2,470
SUBTOTAL	$12,350

UT-3 and 4 Collection of chemical quality, and sediment records.

Bull Creek	4,520
Montezuma Creek (Cost shared with SCS)	2,260
SUBTOTAL	$ 6,780
TOTAL	$19,130

II. Hydrologic Evaluation of the Castle Valley Ridge and Alkali Creek Coal-lease Areas, Utah (UT-173)

R.L. Seiler, Project Chief, (FTS 588-4244)

A. Location: Coal leases in the Wasatch Plateau and Book Cliffs areas in Carbon and Emery Counties, Utah.

B. Objectives: Collect those hydrologic and geologic data in and near the coal-lease areas that have been designated by BLM as priority areas in their coal-lease program. These data will enable the following pre-mining aspects of the local hydrology to be characterized:

1. Surface-water flow, variability in flow, quality, and fluvial-sediment production.
2. Geologic units and their water-bearing characteristics, and identification of geologic structure that may influence hydrology.
3. Ground-water recharge, movement, and discharge; ground-water quality; and ground water in storage.
4. Potential effects on the pre-mining hydrologic system of coal mining in and near the coal-lease areas.

Completion of these objectives will allow BLM to evaluate several water issues that were identified in past environmental impact statements as having insufficient analysis because of deficiencies in data.

C. Approach: The study is being done during the period October 1, 1984 to January 31, 1987 using the following techniques and collecting the following types of data:

1. Measure streamflow in and near the lease areas periodically and correlate flow with that for nearby gaging stations. Estimate average and peak flows using techniques and regression relations developed in the BLM/USGS program. Sample surface water for chemical analysis and periodically for sediment content.
2. Evaluate the water-bearing characteristics of geologic units and hydrologic effects of geologic structure (supplementing available geologic maps with limited field investigations). One test hole will be drilled and tested in each of the project areas if funds are sufficient, and suitable sites that could yield useful data can be located. Where possible, test holes drilled by BLM to evaluate coal resources will also be utilized to obtain hydrologic data. Tests will include determining the water level in each hole, taking a water sample, and attempting to determine hydraulic conductivity of the water-bearing material.

3. Identify sources of ground-water recharge, directions of movement, and points or areas of discharge. Make seepage runs on streams, if suitable stream reaches are available, to identify areas of ground-water recharge and discharge. Make a complete inventory of springs and wells in and near lease areas.

   Use any available ground-water head data to estimate directions of movement. Sample water from springs and wells for chemical analysis. Estimate saturated thickness of geologic units and the volume of ground water in storage.

4. Make qualitative estimates of the potential hydrologic effects of mining using available hydrologic and mine-plan data.

D. Progress: Field inventory and collection of data on water quality, sediment, and stream and spring discharge were completed. Data were tabulated and copies of the tables of chemical analyses were provided to the Bureau of Land Management. Aquifer data from test wells on Castle Valley Ridge and in the Alkali Creek lease were collected and analyzed. A draft of the final report was prepared and is in review.

E. Reports: A final report on the lease areas will be prepared for submission to the WRD Regional Office (preliminary copy to BLM for comments) by April 15, 1987.

F. Distribution of Funds:

Salaries and benefits	$ 21,000
Report processing and printing	4,000
TOTAL	$ 25,000

III. Hydrologic Evaluation of the Quitchupah, Pines, and L.C. Holding Coal-Lease areas, Utah. (UT-176)

Gail E. Cardy, Project Chief, (FTS 588-4187)

A. Location: Coal leases in the Wasatch Plateau and Kolob coal fields in Sevier, Emery, and northwestern Kane Counties, Utah.

B. Objectives: Collect hydrologic and geologic data in and near the coal-lease areas that have been designated by BLM as priority areas in their coal-leasing program. These data will enable the following pre-mining aspects of the local hydrology to be characterized:

1. Average streamflow, variability in flow, quality, and fluvial-sediment production.
2. Geologic units and their water-bearing characteristics and identification of geologic structure that may influence hydrology; and, in the L.C. Holding lease, general stability of local geologic units in relation to sediment production, road construction, and mining.
3. Ground-water recharge, movement, and discharge; ground-water quality; and ground water in storage.
4. Potential effects on the pre-mining hydrologic system of coal mining in and near the coal-lease areas.

Completion of these objectives will allow BLM to evaluate several issues that have been identified in the past environmental impact statements as having insufficient analysis because of deficiencies in data. In addition, data collected in the L.C. Holding lease area to obtain these objectives will allow better evaluation of the following local issues identified by the BLM District Office in Cedar City: (a) pre-mining and potential post-mining fluvial-sediment production in the lease area, (b) stability of geologic units during road construction and of overburden during underground coal-mining (to evaluate the potential for land subsidence), (c) potential effects on the downstream surface-water habitat of the woundfin minnow, and (d) potential effects on the hydrology of alluvial valleys and flood plains if they or underlying aquifers are disrupted by mining, and (e) potential effects on the springs in Zion Canyon, Zion National Park.

C. Approach: The study will be conducted during the period October 1, 1985 to January 31, 1988 using the following techniques and collecting the following types of data:

1. Measure streamflow in and near the lease areas periodically and correlate flow with that for nearby gaging stations. Estimate average and peak flows using techniques and regression relations developed in the BLM/USGS Program. Sample streamflow for chemical analysis and periodically for suspended-sediment content.

2. Evaluate water-bearing characteristics of geologic units and hydrologic effects of geologic structure (supplementing available geologic maps with limited field investigations). Test holes drilled by BLM to evaluate coal resources will be utilized to obtain hydrologic data whenever possible. Tests will include determining the water level in each hole, taking a water sample, and attempting to determine hydraulic conductivity of the water-bearing material. In the L.C. Holding lease area, map extent of alluvial valley areas, if significant, and estimate extent of underlying alluvial aqui- fers. Locate any data on stability of geologic units, espe- cially those that will be overburden during coal mining. Obtain consulting help from Geologic Division on stability of geologic units.

3. Identify sources of ground-water recharge, direction of movement, and points or areas of discharge. Make seepage runs on streams to identify areas of ground-water recharge and discharge if suitable stream reaches are available. Make a complete inventory of springs and wells in and near the lease areas. Use any available ground-water head data to estimate directions of movement. Obtain hydrologic data from nearby existing coal mines in hydrologically similar areas. Sample water from springs and wells for chemical analysis. Estimate saturated thickness of geologic units and the volume of ground water in storage.

4. In the L.C. Holding lease area, drill and test three holes. Testing will include running geophysical logs, measuring water levels, sampling for water quality, and estimating hydraulic conductivity from discharge/drawdown data. The resulting data will indicate aquifer characteristics and help in estimating potential effects of mining on the springs in Zion Canyon, west of the lease.

5. Make qualitative estimates of the potential hydrologic effects of mining using available hydrologic, mine-plan, mine-production, and mining-method data.

D. Progress: Literature search for data from and studies of the lease areas has been completed and field data collection is underway. Surface-water flow and quality has been measured in the L.C. Holding and Quitchupah-Pines lease areas and samples collected for chemical analysis. Springs in both lease areas have been inventoried.

E. Reports: A report will be prepared for submission to the WRD Regional Office (preliminary copy to BLM for comments) by January 31, 1988. It may be decided to prepare a separate report on the Quitchupah-Pines leases for submission by September 30, 1987.

E. Distribution of Funds:

Salaries and benefits	$ 52,000
Travel	9,000
Vehicles	6,000
Supplies and Equipment, base maps	1,000
Drilling and testing 3 test holes, L.C. Holding lease	66,500
Chemical analyses	4,000
Computer services	1,500
TOTAL	$145,000

WYOMING
SUMMARY OF FUNDS

WATER RESOURCES DIVISION

	Project	CMP
I.	Hydrologic Characterization of Streamflow, water quality, and sediment in the Powder River Basin, and Adjacent Areas.	$84,000
II.	Precipitation, Infiltration and Runoff Relations for Small Basins in Wyoming	30,000
III.	The Fluvial System in Energy-Mineral Areas of Wyoming	48,000
	TOTAL	$162,000

I. Hydrologic Characterization of Streamflow, Water Quality, and Sediment In the Powder River Basin and Adjacent Areas, Northeastern Wyoming

Stanley A Druse, WRD Project Chief, (FTS 328-2712)

A. Location: The project area is in the Powder River structural basin and adjacent area in Wyoming.

B. Objective: The objective is to help define existing surface-water conditions in the basin and monitor changes. The basin is rich in energy minerals and has huge coal reserves. The data-collection stations will be at sites where streamflow monitoring is critical to BLM, and the sites will complement an ongoing existing network of stations that are being funded by other government agencies. Miscellaneous equipment at several discontinued streamflow stations will be transferred to BLM for use in their own hydrology studies.

C. Procedures: Standard Geological Survey methods will be used to collect streamflow, water quality, and sediment data at eight stations (see attached table).

1. Operate four continuous record streamflow stations.

2. Collect water-quality samples at five stations on 6-week intervals (10 samples per year) and have them analyzed for salinity (major constituents). Field determinations of pH, temperature, and conductivity will be made.

3. Collect suspended-sediment samples at all stations on 6-week intervals. A medium and high flow suspended sediment and bed material sample will be analyzed for particle size distribution.

D. Report Products: All collected data will be placed in computer storage (WATSTORE) on an ongoing basis and will be published in the annual data report "Water Resources Data for Wyoming." The information will continue to be used in interpretive studies related to hydrology of coal areas.

Distribution of Funds, FY 1987

Station Number and Name	Cost of Data Collection Activity			
	SW	CQ/SED	SED	Total
06313000 South Fork Powder Riv. near Kaycee	$ --	$6,020	--	$ 6,020
06313400 Salt Creek near Sussex	(a)	(b)	2,650	2,650
06313500 Powder River at Sussex	3,025(c)	(b)	3,400	6,425
06317000 Powder River at Arvada	(a)	(b)	2,650	2,650
06365300 Dry Fork Cheyenne River near Bill	6,050	5,150	--	11,200
06365900 Cheyenne River near Dull Ctr.	6,050	5,150	--	11,200
06426500 Belle Fourche River below Moorcroft	6,050	5,150	--	11,200
06643500 North Platte River near Goose Egg	--	6,020	--	6,020
Miscellaneous equipment at discontinued stations	26,635	--	--	26,635
GRAND TOTAL	$47,810	$27,490	$8,700	$84,000

a-Activity funded by another government agency
b-Chemical quality sampling funded by another government agency
c-Partially funded by another government agency

II. Precipitation, Infiltration, and Runoff Relations for Small Basins in Wyoming

James G. Rankl, WRD Project Chief, (FTS 328-2717)

A. Location: Rainfall and runoff data are available for small basins located in the plains and large valley areas of Wyoming.

B. Objectives: (1) To define Green and Ampt infiltration parameters for soils and other surficial materials found in the semiarid areas of Wyoming. (2) to determine the relation between infiltration rates computed from rainfall and runoff studies and those computed from infiltrometer tests. Federal regulations concerning surface coal mining and reclamation operations specifies use of a precipitation-frequency criteria for hydraulic design. The problem is to determine runoff volumes from small basins for selected precipitation frequencies. Variability of infiltration rates for soils and other surficial materials requires an understanding of the hydrologic processes controlling the relations of precipitation, infiltration, and runoff in small drainage basins.

C. Approach: Existing rainfall-runoff data collected at small semiarid basins will be used in conjunction with Soil Conservation Service soil maps and descriptions to define infiltration parameters. Three assumptions were made for this study: (1) the initial water uptake includes interception, surface retention, and channel storage; (2) antecedent moisture conditions for a given storm is some long-term average and (3) rainfall for a given storm is uniform in both space and time. With the above assumptions and the existing data, a modified Rosenbrock-optimization technique will be used to determine the infiltration parameters. In a nearby test basin, runoff computed from rainfall using the optimized infiltration parameters will be compared to observed runoff in order to determine the transfer value of the computed parameters. Infiltration data will be collected using a portable infiltrometer developed by McQueen (USGS). These data will be analyzed statistically and compared to basin runoff.

D. Report Products: The final report will describe the infiltration equations, soil types and the infiltration parameters for each of the soils. The final report will be Water-Supply Paper of the Geological Survey and will be prepared and submitted for directors approval by September 30, 1987.

E. Distribution of Funds:

Salaries	$20,000
Printing and Supplies	10,000
Total Funding	30,000

III. The Fluvial System in Energy-Mineral Areas of Wyoming (BLM-RDTS-7210.119)

Hugh W. Lowham, WRD Project Chief (FTS 328-2722)

A. Location: Powder River and Green River/Hams Fork Coal Regions of Wyoming.

B. Objectives: The objectives of the study are to describe the processes of the fluvial system for the coal areas of Wyoming and to present procedures and case histories that can be used in land-use planning to minimize erosion and provide stable drainage networks. This information can be used in land-use planning and coal leasing throughout the State to mitigate impacts of strip mining.

C. Approach: A literature search has been made to summarize knowledge applicable to channel formation and drainage development. Case histories of channel response to various past developments in Wyoming will be described to highlight the need for planning and design of stream-related projects. Channel and drainage-network data are measured with a computerized digitizer from topographic maps. Using these data, quantitative relations will be developed to aid in land-use planning and design of projects that affect runoff and channels.

D. Progress: A sample of 102 small basins in northeastern Wyoming was selected for determining physical characteristics of natural drainage networks. Twenty-two characteristics were measured for each of the basins using topographic maps and a digitizer. Graphs and relations were then developed among the characteristics found to be most important to landscape stability. Basins in other areas of Wyoming are currently being selected for addition to the data base. A progress report that describes in detail the work done so far was provided to BLM in July 1984.

E. Report Products: A final report will be prepared in Fiscal Year 1987 that summarizes these data, predictive relations, case studies, and alternative procedures that can be used for planning and designing land uses where the fluvial system is subject to alteration.

F. Distribution of Funds:

Salaries	$38,000
Travel	4,000
Report Preparation	6,000
TOTAL	$48,000

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Summary

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